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Sustainable Energy for the Arctic. WILLIAM F. ISHERWOOD, GLENN D. RAMBA(and JOHN F. COOPER (Lawrence Livermore National Laboratory, L-629, P.O. Box 808, Livermore, CA 94551)

Arctic communities commonly generate their electric power from diesel fuel, which i shipped in at high cost and creates significant environmental impacts. Alternatively, indigenc renewable energy sources can be efficiently tapped. Intermittent winds and discontinuous str flows, for example, can be utilized for reliable, uninterruptable power, if coupled with effectiv energy storage.

Renewable resources can contribute excess generating capacity to electrolyze water, generating hydrogen. Hydrogen can then be stored for later use in fuel cells or converted inte combustion engines. Likewise, a new zinc-ferricyanide fuel cell design allows spent electroly to be regenerated using available electric power. External stockpiling of zinc and electrolyte make it effective for long-term energy storage.

Hydrogen and zinc-ferricyanide storage have a cost advantage over lead-acid batteries long-term electricity storage, in that increased energy reserve (i.e., kilowatt-hours) is added by increasing the external storage, at very low cost. Stored hydrogen or zinc do not loose energy storage for reasonable periods and involve no toxic materials.

Although turn-around efficiency of electricity storage by hydrogen (~30%) is less tha lead-acid (~70%), the lost cost of added storage makes it cheaper for storing more than about day's worth of energy. Early versions of the zinc-ferricyanide system showed efficiencies of >85%, but additional development is required to field a utility-scale test.

Recent advances in the fields of energy storage and renewable energy generation mak feasible to supply remote Arctic communities with reliable power at competitive cost, withou dependency on imported fossil fuels and their associated environmental problems.

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